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PENSOFT

Expansion of the known range of the Lesser Bulldog Bat, *Noctilio albiventris* Desmarest, 1818 (Chiroptera, Noctilionidae) in the Brazilian Cerrado

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Abstract

The Lesser Bulldog Bat, *Noctilio albiventris*, is found in all major Brazilian phytogeographic domains. We extend the known distribution of this species in the Cerrado, where 3 specimens were collected in the municipality of Caxias, which is within the Cerrado domain of the state of Maranhão, northeastern Brazil. Our analysis of the COI gene confirms the morphological identification of the specimens, based on a 99.8–100% similarity with known sequences. This record extends the known distribution of *N. albiventris* 260 km to the east, in the state of Maranhão, and 986 km to the north, in the Cerrado biome.

Keywords

Maranhão; bats; DNA barcode; mitochondrial gene.

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Introduction

Noctilio Linnaeus, 1766 is the only genus in Noctilionidae (Hood and Jones 1984, Nogueira et al. 2014). The 2 species currently recognized—the Lesser Bulldog Bat, *Noctilio albiventris* Desmaret, 1818, and the Greater Bulldog Bat, *Noctilio leporinus* (Linnaeus, 1758)—occur in sympatry (Gardner 2008) and share the following diagnostic characters: cleft upper lip, 3 phalanges on the third finger, well-developed calcaneum and claws on the feet, and tail shorter than the uropatagium (Hood and Pitocchelli 1983, Reis et al. 2011). While similar in several respects, these species can be promptly distinguished based on their body size (Khan et al. 2014).

Noctilio albiventris is smaller than *N. leporinus*, having a wingspan of 400 mm (Hood and Pitocchelli 1983), head-body length of 75 mm, and forearm length ranging from 55 to 65 mm (Nowak 1991). Its pelage is also shorter than that of the latter species (Reis et al. 2013). *Noctilio albiventris* presents a wide but discontinuous range from southern Mexico to northern Argentina and western Uruguay (Reis et al. 2007, Gardner 2008), including the Caribbean Islands (López-Baucells et al. 2016). In Brazil, it is found in all major phytogeographic domains, including Amazônia

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Figure 1. Variation in the ventral coloration of *Noctilio albiventris* from Caxias, state of Maranhão, northeastern Brazil. **A.** UFPB 9819. **B.** UFPB 9818. **C.** View of the dorsal stripe, UFPB 9820.

(Acre, Amazonas, Amapá, Pará, Roraima, Maranhão, and Mato Grosso states), Cerrado (Mato Grosso, São Paulo, Tocantins, and Minas Gerais), Caatinga (Bahia, Ceará, Piauí, Sergipe, and Minas Gerais), Pantanal (Mato Grosso do Sul), Atlantic Forest (Rio de Janeiro, São Paulo, Paraná, and Sergipe), and Pampa (Paraná) (Miretzki 2003, Gardner 2008, Dias et al. 2009, Bezerra and Marinho-Filho 2010, Rocha et al. 2010, Peracchi and Nogueira 2010, Pavan et al. 2013, Reis et al. 2013, Nogueira et al. 2015, Garbino 2016). We present here the first record of *N. albiventris* for the Cerrado in the state of Maranhão and extend the known distribution of this species in this biome.

Methods

Specimens were collected under the license IBAMA/SISBIO 42670-3 and deposited in the Universidade Federal da Paraíba (UFPB), João Pessoa, Paraíba, Brazil. They were fixed in 10% formalin and then transferred to 70% alcohol. Body weight and forearm length were obtained, respectively, with a Pesola spring scale and a digital caliper, and age classes (juvenile/adult) were determined according to Brunet and Austad (2004). Total DNA was extracted from muscle tissue using the Promega Wizard Genomic DNA Purification kit, following the manufacturer's instructions. The mitochondrial cytochrome oxidase subunit 1 (COI) gene was amplified by polymerase chain reaction (PCR) using the primers LCO-1490 and HCO-2198, as described by Folmer et al. (1994). The samples were sequenced by the dideoxy-terminal method of Sanger et al. (1977), using a Big Dye kit in an ABI Prism™ 3500 (Applied Biosystems, USA) automatic sequencer. The sequences were plotted on the BOLD Systems platform to obtain similarity.

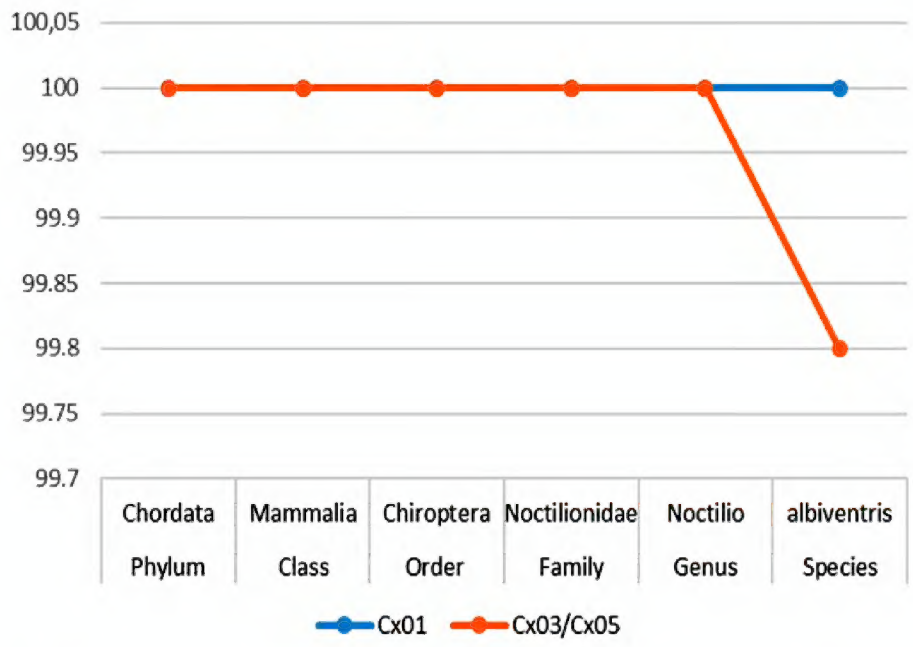

Figure 2. Similarity obtained from the BOLD Systems platform for specimens of *Noctilio albiventris* from Caxias, state of Maranhão, northeastern Brazil.

Results

New records. Brazil, Maranhão, East Maranhão mesoregion, center of the municipality of Caxias, Acrísio Cruz Street (04°51′32″ S, 043°21′22″ W), coll. Olímpio, APMO; Cardoso, FHS; Costa, CLS, 15 February 2017, 3 adult males (UFPB9818–9820).

The neighborhood in Caxias where the new record originates has extensive tree cover and is located along the Itapecuru River. The specimens of *N. albiventris* were sharing their roost with individuals of *Molossus rufus* É. Geoffroy, 1805 (Molossidae) and *Artibeus* sp. Leach, 1821 (Phyllostomidae, Stenodermatinae).

Identification. The 3 specimens of *N. albiventris* ranged from 27.8 to 30.2 g, while forearm lengths ranged from 62 to 64 mm. All specimens presented the typical dorsal stripe, but their coloration varied considerably, ranging from grayish-brown to orange on the dorsum, and light-gray to orange on the venter (Fig. 1). In both measurements and coloration these specimens are consistent with descriptions presented by Gardner (2008) and Reis et al. (2011, 2013).

Results of the COI gene analysis confirm our morphological identification of our specimens, with 100%, 99.8%, and 99.8% similarity with data available in the BOLD Systems platform for specimens of *N. albiventris* from Guyana (Fig. 2). From these results, we infer that our specimens belong to the *N. a. albiventris* lineage.

Discussion

Noctilio albiventris roosts in caves, rock crevices, buildings, and tree holes, usually near water bodies (Hood and Pitocchelli 1983, Nogueira and Pol 1998, Alcantara et al. 2016). This species has also been recorded roosting with *Rhynchonycteris naso* (Wied-Neuwied, 1820) (Emballonuridae) and species of *Molossus É*. Geoffroy, 1805 (Hood and Pitocchelli 1983, Nogueira and Pol 1998). The only previous record of *N. albiventris* for the state of Maranhão is in the municipality of Santa Inês, within the Amazon biome. Our specimens, therefore, are only the second record of this species in Maranhão and the first evidence of the occurrence of this species in the Cerrado biome in this state. Based on the previous nearest records in Maranhão (Santa Inês) and in the Cerrado biome (São Domingos River, Paranã, 12°54′50.8″ S, 047°34′00.7″ W, Tocantins; Bezerra and Marinho-Filho 2010), the known distribution of *N. albiventris* is extended by, respectively, about 260 km to the east and 986 km to the north (Fig. 3).

Data from the COI gene reveals less than 1% of divergence with respect to *N. albiventris* specimens from Guyana, which is below the 3% limit established by Hebert et al. (2003) for separation of species and corroborate our morphological identification. This mitochondrial gene has been studied for several bat families (Noctilionidae, Phyllostomidae, Vespertilionidae, and Molossidae) and is an effective tool for species identification (Clare et al. 2007, Clare et al. 2011, Gager et al. 2016). The subspecies, *N. a. albiventris*, to which we assign our Maranhão specimens, is the most widely distributed among the 3 subspecific taxa currently recognized for the species *Noctilio albiventris*, and occurs from northern Venezuela to the Guianas, and along the greater Amazon basin and the Brazilian coast (Davis 1976, Gardner 2008, Pavan et al. 2013).

Acknowledegments

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Authors' Contributions

APMOlímpio: collected and identied specimens, analyzed genetic data, wrote and revised the manuscript; FHSC collected and identified specimens; CLSC collected, extracted DNA and analyzed genetic data; ECF and MCBarros wrote and revised the manuscript.

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Figure 3. Map showing locality records for *Noctilio albiventris* in the state of Maranhão, northeastern Brazil (1 and 2), along the Cerrado biome (medium gray; 2, 4–7, 9), and in a bordering area (3) in the Caatinga biome (dark gray). Localities 1 and 8 lie in the Amazon biome (light gray). 1 = Santa Inês, MA (03°39'51.94" S, 045°23'02.2" W), 2 = Caxias, MA (04°51'32" S, 043°21'22" W), 3 = Riacho Mocambinho, Jaíba, MG (15°05'49" S, 044°02'04" W), 4 = Unaí, MG (16°23'45.1" S, 046°54'09.92" W), 5 = Uberlândia, MG (18°54'52.59" S, 048°16'31.37" W), 6 = São José do Rio Preto, SP (20°48'42.3"S, 049°22'34.4"W), 7 = Cuiabá, MT (15°36'5.08" S, 056° 5'52.41" W), 8 = São Domingos, MT (15°17'20.44" S, 59°03'26.31" W), 9 = São Domingos River, Paranã, TO (12°54'50.8" S, 047°34'00.7" W).

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